

Doubled-up legume technology

Intercropping two grain legumes with different growth habits increases land productivity and provides more types of food

Introduction

Farmers are used to intercropping two or more crops in their fields, and usually this involves maize and groundnut or cowpea. The reasons for intercropping are many, including

- to get more crops if land is limited
- some crops are considered too minor to occupy land on their own
- to diversify family diet and income sources

Intercropping two legumes that have different growth habits (the doubled-up legume technology) is a relatively new practice. It is an approach that takes advantage of beneficial interactions between the two legume crops.

- Successful doubled-up legume intercropping systems mostly involve pigeonpea. It has been established that pigeonpea grows very slowly for the first 2 months after planting which makes it very suited to intercropping (including with maize).
- It follows that pigeon-pea can be intercropped with either groundnut or soybean, without too much competition for water, nutrients and sunlight [see Photo A]
- Pigeonpea only starts rapid growth when soyabean or groundnut are approaching maturity (groundnut understorey in Photo B)
- Groundnut or soyabean mature first in about 4 months and are harvested during May [-Photo C]. After this, pigeonpea continues to grow as a sole crop, forms pods, and will be harvested later [Photo D]
- This way we 'double' the crops/food and 'double' the soil fertility benefits since both legume crops add fertility to the soil.



Steps to establish soyabean-pigeonpea doubled-up cropping

Step 1: Plant soyabean

- ❖ Remember to use rhizobia inoculants if you are using varieties that require inoculation (see the How to Grow Soyabean guidelines for details)
- ❖ Soyabean needs moist soil for germination. The seeds must not be dry-planted and should not be planted until it is clear that the rainy season has properly started (plant after a few days of rainfall!).
- ❖ Make ridges that are 75 cm apart, just as for maize, so that the normal ridging system is not disrupted by the production of soyabean. Avoid ridges wider than 75 cm as this is wasting our precious land
- ❖ Plant soyabean in 2 shallow furrows (3 cm deep at most) that can be made with a stick on each side of the ridge. Two rows per ridge (instead of only one) ensure high plant population > 250,000 plants per hectare. This results in good soyabean yields.
- ❖ Within a row, drop (sprinkle) the soyabean seeds at about 5-8 cm apart. Remember, these seeds must be planted no more than 3 cm deep, otherwise germination will not be good.
- ❖ About 90 kg of seed is required to plant one hectare (about 35 kg per acre). For varieties with small seeds, less quantities of seed will be required
- ❖ A farmer planting a 30 x 40 m field size requires only 10 kg soyabean seed
- ❖ Weeding should be done at least 2 times to keep fields weed-free, especially early in the season. With high plant populations, soyabeans have the ability to shade out other plants, so a high soyabean population is helpful in control of weeds.

Step 2: Plant pigeonpea -on the same day

- ❖ On the ridges already planted with soyabean, plant 3 pigeonpea seeds per planting station at 90 cm spacing. This results in about 44,000 plants per ha
- ❖ This single row of pigeonpea must be at the centre (top) of the ridge
- ❖ Only 8 kg of pigeonpea seed is required to plant 1 ha of a soyabean/pigeonpea doubled up system
- ❖ A farmer planting a 30 x 40 m field size requires only 1 kg pigeonpea seed
- ❖ In this intercrop, soyabean is harvested earlier, and then the pigeonpea remains as the only crop in the field (see photo C)
- ❖ The benefit of the pigeonpea to next year's crop on that field (usually maize) is due to the large amount of pigeonpea leaves that fall to the ground as the crop matures. These add a lot of organic mulch that enriches the soil fertility.

Steps to establish groundnut-pigeonpea doubled-up cropping

Step 1: Plant groundnut

- ❖ To maximize yields, groundnut must be planted early, with the first effective rains - a delay in planting will cause a marked drop in yield
- ❖ Make ridges that are 75 cm apart (just as for maize and soyabean), so that the normal ridging system is not disrupted by the production of groundnut. Avoid ridges wider than 75 cm as this wastes precious land
- ❖ Plant 2 rows of groundnut on either side of each ridge, at about 5-8 cm depth. Too shallow planting will result in patchy germination as the surface soil can dry out if there is no further rainfall after planting. Planting too deep will delay germination
- ❖ Within each row, plant groundnut seeds 10-15 cm apart. The double rows on each ridge and using this seed spacing will ensure high plant populations (> 200,000 plants/ha), and good harvests
- ❖ Seed requirements per hectare range from 80-100 kg, depending on the groundnut variety and seed size
- ❖ A farmer planting 30 x 40 m size field requires only 10 kg groundnut seed
- ❖ Keep fields weed-free by early weeding and pulling off late weeds by hand from the field.

Step 2: Plant pigeonpea -on the same day

- ❖ On the ridges already planted with groundnut, plant 3 or 4 pigeonpea seeds per planting station at 90 cm spacing. This results in about 44,000 plants/ha
- ❖ This single row of pigeonpea must be at the centre (top) of the ridge
- ❖ Only 8 kg pigeonpea seed is required to plant 1 ha of the soyabean/pigeonpea doubled up system
- ❖ A farmer planting a 30 x 40 m sized field requires only 1 kg of pigeonpea seed
- ❖ In this intercrop, the groundnut is harvested earlier, and then the pigeonpea remains as the only crop in the field (see photo C)
- ❖ The benefit of the pigeonpea to next year's crop on that field (usually maize) is due to the large amount of pigeonpea leaves that fall to the ground as the crop matures. These add a lot of organic mulch that enriches soil fertility.

Fertilizer management in doubled-up legume systems

- ❖ When a doubled-up intercrop of soyabean or groundnut is grown in rotation with a crop that received NP fertilizer the previous season, there is no need to apply any fertilizer that year
- ❖ On poor soils, apply a 50 kg bag of NP (23:21:0) fertilizer per hectare at planting. This will supply some nutrients (especially phosphorus) for the 'small nitrogen fertilizer factories' on the roots to work better. We call this process biological nitrogen fixation. Please read the guidelines on soyabean and groundnut production for more details on this subject
- ❖ There is no need to apply UREA or other N fertilizer on doubled-up legumes in your field. These are 'magic' crops which manufacture their own 'UREA'. Save your urea for maize that desperately needs it!

Harvesting and residue management

- ❖ Follow the guidelines for harvesting as given in the other pamphlets on groundnut and soyabean
- ❖ Harvest pigeonpea when pods are brown and sometimes when they produce a rattling sound upon shaking
- ❖ At pigeonpea maturity, there will be a carpet of pigeonpea leaves on the ground. This is the magic. The fertilizer factories in the soil have done a great job. They have made the crop produce a lot of leaves (as well as protein-rich grain for food for us to eat)
- ❖ The leaves on the ground will be nitrogen UREA fertilizer for the next crop. Next season, please make sure you plant maize on this plot. You will require less fertilizer for it to grow well
- ❖ Never burn these pigeonpea residues - you will be burning a good source of enriching your soil
- ❖ Wise farmers never burn crop residues - they also use crop residues to produce more manure through composting.

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